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THE IMMEDIATE EFFECT OF ACUPUNCTURE ON THE
ENCEPHALOGRAMS OF EPILEPTIC PATIENTS

By Feng Ying-k'un

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FOREWORD

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THE IMMEDIATE EFFECT OF ACUPUNCTURE ON THE
ENCEPHALOGRAMS OF EPILEPTIC PATIENTS

The following is a translation of an article written by Feng Ying-k'un, Wang Chi-ku, Chiang Hua-teh, Li Tzu-hsueh, Kuo Mei-yu and Li Fang-ch'en, Department of Neurology, Peking Union Hospital, Chinese Academy of Medical Sciences, in Chung-hua Shen-ching Ching-shen-k'o Tsa-chih (Chinese Journal of Neurology and Psychiatry), Vol V, No 5, pages 339-345, Peiping, 1 Oct 1959.

Acupuncture is a special medical technique of the Chinese. Its principles and manipulations had been recorded in detail in the Su-wen and Ling-shu sections of the Yellow Emperor's Classics during 5-3 centuries B.C. Scholars since have both supplemented and commented on the acupuncture sites and their specific cures. The employment of acupuncture in the treatment of epilepsy has been in practice for a long time with certain therapeutic effects. For example, Lu Chih-chun treated 3

cases of epilepsy by acupuncture. Among them, 2 recovered and 1 had milder attacks. Chu Lien recorded 85 cases of epilepsy. After acupuncture treatment, 7 cases were cured, 14 distinctly improved and 43 improved. The efficacy rate was 75.29%. Ch'in Chen reported acupuncture treatment of 8 epileptic patients. Among them 3 were ill for less than 5 years; 3, less than 10 years and 2, over 10 years. Half of these were symptomatic type and half idiopathic type. The intervals between attacks prior to treatment were 1-10 days. After treatment, intervals became twice as long in 7 cases and the duration of attacks were distinctly shortened in 7 cases. The 4 grand mal cases had only temporary mental blocks but no more convulsive seizures after acupuncture treatment. Sun Chen-huan and others reported one case of continuous state of epilepsy and one persistent grand mal in which acupuncture also supplemented the inadequacy of drug therapy. These very exciting therapeutic results are worth being noted and further observed. In response to the summons of the Party and the government in relation to adoption and reorganization of traditional medicine, we have observed preliminarily the immediate effect of acupuncture

on the encephalograms of epileptic patients and analyzed the results obtained in search of the clinical use of acupuncture in epilepsy.

Method

After the clinical examinations and routine tests on our 23 epileptic and 2 non-epileptic patients were completed, they were scheduled for electroencephalograms. The instrument we used was the British Ediswan Mark II model 8 pen electroencephalograph. After the 12 silver chloride electrodes were placed at the standard positions over the subject's scalp, "unipolar" or "bipolar" recordings were traced. Each group was recorded for 3 minutes and a total of 20-30 minutes of recordings were traced for the various groups. Acupuncture was then applied and continuous "unipolar" or "bipolar" recordings were taken during the processes of insertion, rolling \angle slowly, between thumb and forefinger, not more than 180 degrees in either direction \angle , retention in situ \angle and not disturbed for a definite period of time \angle and withdrawal of the needles. Each needle was rolled for one minute at the site on each side and retained for at least 5

minutes in situ before it was withdrawn. The major sites selected were Pai-hui, Jen-chung, Shen-men, Nei-kuan, Ho-ku and Tsu-san-li, etc. In cases Nos 8 and 9, needles were inserted over sites of no concern. The manipulative technique P'ing-pu p'ing-hsieh was employed and exercised by the same person for the majority of cases. [P'ing-pu p'ing-hsieh designates the manipulative technique in which the needle is inserted "neither fast nor slowly," slightly rolled between the thumb and forefinger in both directions, and withdrawn when the patient has felt a definite sensation.] In case No 7, needles were deeply inserted with also deep bunched-needle acupuncture [acupuncture in which several needles bunched together are employed] over the lumbosacral region, soles and back of the neck. The majority of these cases had been taking anti-epileptic drugs for many days before they received the acupuncture. Patients had no complaints about the acupuncture procedure. Only 2 cases Nos 15 and 17 wept because of headaches developed during the excessively long electroencephalogram recordings.

Experimental Results

The group of patients included 23 epileptic and 2 non-epileptic (one patient suffered from neurosis and the other from cavitary myelitis) cases. Among them, 18 were male and 7 female; 12 over 20 years and 13 under 20 years of age. Of the 23 epileptic patients, 19 suffered from grand mals (2 had brain infections during childhood, 1 had a history of premature birth and infantile jaundice, 1 had a familial history, 1 had deformities of the cerebral artery and the others with unknown causes); 1 petit mal; 2 grand and petit mals; and 1 grand mal and psychomotor attacks (all with unknown causes).

According to our observations, three different types of reactions were elicited in the brain waves of the epileptic patients. The first ^{group} included 11 epileptic patients (cases Nos 3-13). Among these, 1 was 10 years old; 1 was 11 and the others were 17-41 years old. The average duration of illness was 6 $\frac{1}{3}$ years. The pre-existing electroencephalograms of these patients all showed a mild to medium degree of irregularities of the brain waves. In 4 of these

patients, no reactions of any kind appeared during the processes of insertion, rolling, retention or withdrawal of the needles. In 7 of them, there appeared an occasional attention phenomenon (amplitude lowered and frequency increased), but the acupuncture had no effect on the pre-existing wave irregularities. No more reactions than this were noticed in cases Nos 8 and 9 in which needles were inserted over sites of no concern, or in case No 7 in which deep acupuncture over

Shen-men and also deep bunched-needle acupuncture over the lumbosacral region, soles and back of the neck were applied.

The second group included 5 epileptic patients (cases Nos 14-19 [?]). Only one of them was 38 years old (case No 9 with a duration of illness of 13 years [data do not agree with those in the table]), and the others were 6-21 years old. The average duration of illness was $3\frac{1}{4}$ years. The pre-existing electroencephalograms of these patients elicited a medium degree of abnormality in 3 cases and a high degree of abnormality in 2 (both had spike and slow wave complexes). In this group of patients during the insertion, rolling and withdrawal of needles, transient high vol-

tage slow waves appeared in 2 cases (Nos 14 and 16); much more temporary spikes and slow wave complexes appeared in 2 (Nos 15 and 17); and transient spike and slow wave complexes, spikes or slow waves in 1 (No 18).

The third group included 7 cases of epilepsy. Except for one over 38 years old (No 19 with a duration of illness of 5 years), the others were all 6-21 years old. The average of duration of illness in this group was $4\frac{1}{6}$ years. The pre-existing electroencephalograms of these patients showed a medium degree of abnormality in 3 cases and a high degree of abnormality (spike and wave complexes) in 4 cases. In 5 of them (Nos 19-23) better regulations of waves were seen after the acupuncture. The pre-existing slow waves or spike and wave complexes were reduced and the amplitude lowered. After the withdrawal of the needles, slow waves or spike and slow wave complexes increased again. In another 2 cases (Nos 24 and 25), after the insertion and rolling of the needles the frequency and length of the pre-existing long-coursed bilateral synchronized and diffused spike and slow wave complexes were distinctly reduced. They became

more frequent again after the needles were withdrawn. In the two 19 and 27 year old non-epileptic patients, the pre-existing well-regulated and almost sustaining alpha rhythm elicited no changes of any kind during the acupuncture procedures. The eye opening and closing reactions in all 25 cases were normal. In only 3 cases, the brain waves were unusually augmented during hyperventilations.

Discussion

The effect of acupuncture on human brain waves has not yet been reported in world literature. Benjamin and Ivy found that when the forearm painspot was pricked by von Frey's hair and when the skin on the back of the hand between the thumb and forefinger was clamped with forceps, there was a distinct lowering of the voltage in the waves of both sides of the vertex, occipital, temporal and frontal regions, and that these could not be explained by the usual attention phenomena. They also pointed out that pain and non-painful (cold, heat and touch) stimulations produced the same effect on the brain waves with no

special characteristics. These stimulations were somewhat similar to acupunctures.

According to our knowledge, the experimental result of Chang Ch'un-liang obtained from 31 normal subjects showed that after acupuncture or moxibustion, distinct changes were seen in 9, little change in 10 and no change at all in the other 12. When Wang Pen-hsien applied acupuncture to 53 subjects, 24 showed an increase in alpha rhythm; 7 showed a reduced alpha rhythm; and no changes in the electroencephalograms in 22. In our 2 non-epileptic patients, acupunctures did not induce any kind of change as in Chang and Wang's third type of reaction. In 1959 the Department of Neurology of Shanghai Jen-chi Hospital found that during the grand mal seizures of idiopathic epileptics, acupuncture over Shen-men by Chung-hsieh method caused the slow waves to disappear for 12 minutes. Contrarily, during petit mals of the idiopathic epileptics, the same acupuncture would cause an increase of slow waves. Although the manipulative technique was different from what we employed, the results, however, were in many respects quite similar to those we have obtained.

The Immediate Effect of Acupuncture on the Encephalogram of Epileptic Patients

No	Sex	Age	Diagnosis of illness	Duration of illness	Cause	Electro-encephalogram	Sites	Reaction to Acupuncture
1	M	27	Neurosis	11 mos		Non-symmetrical	Pai-hui Jen-chung Shen-men Tsu-san-li	None
2	F	19	Cavitary myelitis	2 mos		Normal	Nei-kuan Chu-ch'ih Shen-men Ho-ku Chien-yu	None
3	M	10	Epileptic grand mal	4 mos	Infection	High voltage wave irregularity	Pai-hui Jen-chung Shen-men	None
4	F	22	Epileptic grand mal	7 yrs	Unknown	Low voltage activity	Pai-hui Shang-hsing Shen-men Tsu-san-li	None
5	M	40	Epileptic grand mal	1 ⁺ yr	Unknown	Low voltage activity	Pai-hui Jen-chung Shen-men Tsu-san-li	None
6	F	41	Grand mal psychomotor	3 yrs	Unknown	Wave irregularity	Pai-hui Jen-chung Shen-men Ho-ku	None
7	M	20	Epileptic grand mal	11 yrs	Unknown	Wave irregularity	Pai-hui Ta-chui Shen-men Tsu-san-li	Attention phenomena
8	M	23	Epileptic grand mal	8 yrs	Unknown	Wave irregularity	Pai-hui Jen-chung Shen-men unconcerned	Attention phenomena

9	M	38	Epileptic grand mal	11 yrs	Unknown	Wave irregu- larity	Hou-chi Ch'eng-chiang Shen-men unconcerned	Attention phenomena
10	M	21	Epileptic grand mal	10 ⁺ yrs	Unknown	Slow wave irregularity	Pai-hui Jen- chung Shen-men	Attention phenomena
11	M	31	Epileptic grand mal	7 yrs	Unknown	Slow wave irregularity	Pai-hui Jen chung Shen-men	Attention phenomena
12	M	17	Epileptic grand mal	10 ⁺ yrs	Unknown	Slow wave irregularity	Pai-hui Jen- chung Shen-men	Attention phenomena
13	M	11	Epileptic grand mal	1 $\frac{1}{2}$ yrs	Premature birth infantile jaundice	Wave irregu- larity	Nei-kuan Jen-chung Shen-men	Attention phenomena
14	M	6	Epileptic grand mal	10 days	Unknown	Wave irregu- larity	Jen-chung Shen-men	During insertion and rolling of needle, 4-5 wave/ sec appeared for about 1 sec.
15	M	12	Epileptic grand mal	9 yrs	Infection	Abnormal amplitude	Pai-hui Ta- chui Shen-men Feng-fu T'ao- tao T'ung- t'ien Chien- ch'ia	During insertion and rolling of nee- dle over Ta-chui & T'ao-tao, spike and wave complex appear- ed for 2-4 sec.

16	M	21	Epileptic grand mal	2 yrs	Unknown	High voltage slow activity	Pai-hui Jen chung Shen-men	During insertion and rolling of needle, voltage slightly increased and frequency reduced
17	M	14	Epileptic grand mal	7 yrs	Unknown	Abnormal amplitude	Nei-kuan Ch'eng-kuan Tsao-hai Tsu- san-li Ta-tui T'ao-tao	After insertion and rolling over Ta-tui and T'ao-tao, spike and wave complexes appeared for 2-4 sec.
18	M	38	Epileptic grand mal	13 yrs	Familial history	Slow wave irregularity	Ch'eng-chiang Shen-men Tsu-san-li	After insertion and rolling of needles spike and wave com- plex (2-3sec), spikes or slow wave appeared
19	F	38	Epileptic grand mal	5 yrs	Deformity of cere- bral ar- tery	Slow wave irregulari- ty	Jen-chung Shen-men	Frequency more regu- lar, slow wave reduced
20	M	15	Epileptic grand mal	Few days	Unknown	Slow wave irregularity	Nei-kuan Jen- chung Shen-men	Attention phenomena, Slow wave voltage reduced. Return of more high voltage slow wave after with- drawal of needles
21	F	21	Epileptic grand mal	7 yrs	Unknown	Abnormal amplitude	Pai-hui Jen- chung Shen-men Tsu-san-li	After insertion and rolling of needles, slow wave reduced, frequency more stable, less spike and wave

complexes. Increase of spike and wave complexes 8 sec after withdrawal of needles

Attention phenomena; distinct decrease in irregular slow waves and lowered voltage

After acupuncture, slow waves reduced; frequency and amplitude better and spike and wave complexes reduced

Spike and wave complexes distinctly reduced, increased again after withdrawal of needles

During insertion and rolling of needles, spike and wave complexes markedly reduced, increased again after withdrawal of needles

Nei-kuan
Jen-chung
Shen-men

Nei-kuan
Jen-chung
Shen-men

Pai-hui
Jen-chung
Shen-men

Pai-hui
Jen-chung
Shen-men

Wave irregularity

Abnormal amplitude

Abnormal amplitude

Abnormal amplitude

Unknown

Unknown

Infection

Unknown

$\frac{1}{2}$ yr

3-9 yrs

2 $\frac{1}{2}$ yrs

6 yrs

Epileptic grand mal

Epileptic grand and petit mal

Grand and petit mals

Petit mal

14

15

13

6

F

M

F

M

22

23

24

25

The first group of 11 epileptic patients did not have any reactions during acupuncture procedures or showed only transient attention phenomena which did not alter the pre-existing wave irregularities. Further analysis showed that in this group, except for two child patients, all were middle-aged with also longer durations of illness ($6\frac{1}{3}$ years). However, they were in accord as to the cause of the disease and the pre-existing wave irregularity in the encephalograms. Thus, it appeared that in older patients with longer durations of illness, nervous activity acted according to the stereotyped pattern formed by pathological dynamics. The electroencephalogram that represented the activity of the cerebral cortex was therefore not affected by the relatively mild (such as acupuncture) stimulations. If this is true, acupuncture then can be used as a diagnostic aid on the cortical activity of epileptics. When the abnormal electroencephalogram is not affected by acupuncture, it means that the disordered cortical function cannot be altered. It is, therefore, also useful as a prognostic aid. Cases of this kind also have limitations

in drug therapy. Hence, acupuncture has the same functional purpose as such other measures as the Shan-kuang Chieh-lu T'ung-hua (scintillating regulation assimilation) in the determination of cortical activity.

Contrarily in the second and third groups of 12 patients, except for 2 over 38, all of them were 6-21 years old. The duration of illness was distinctly shorter than that of the first group (only 3-4 years). These two groups of patients could reveal two types of reactions toward acupuncture. The electroencephalograms of the patients of the second group showed transient high voltage slow waves or spike and wave complexes after acupuncture. In the third group, the pre-existing high voltage slow waves became less frequent with a better regulation of amplitude and frequency. Or, the pre-existing long-coursed bilateral synchronized and diffused spike and wave complexes were distinctly reduced both in frequency and duration. They became more frequent again after the needles were withdrawn. These all indicated, in these two groups of patients, a plasticity of the cortical function which patients of the first group did not have. It could be due to the fact that in these two groups of patients who were

younger in age with shorter durations of illness the pathological dynamic stereotype had not yet been formed. If acupuncture was employed at this time, the unfavorable reactions resulting from the internal and external stimulations could be reduced by the establishment of conditioned reflex. When stimulations entering the whole network are reduced, the excitatory state (epilepsy) of the cortex will also be milder. If this is true, acupuncture therapy will produce a good effect during the early stages (childhood stage) of epilepsy.

In the second group of patients, the transient high voltage slow waves or spike and slow wave complexes elicited in the electroencephalograms after acupuncture was a synchronization phenomenon whereas the distinct reduction in the pre-existing long-coursed spike and wave complexes in the third group of patients was a desynchronization phenomenon. As to why a synchronized effect was elicited in the second group and desynchronized effect in the third group, it appeared to be determined, according to Li, Jasper and Henderson, by the excitatory state of the cerebral cortex of each individual patient.

Figure 1

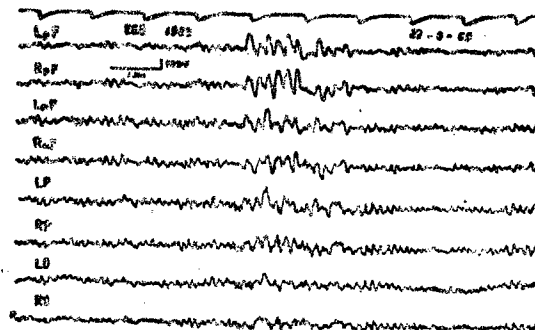
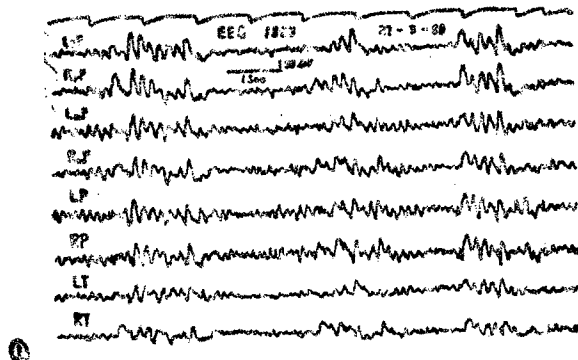
Case No 18, age 38, laborer, had frequent grand mal seizures for 9 years. Father had history of convulsive seizures. Electroencephalogram showed medium voltage 7-9 wave/sec short course rhythm; regulation not good; intermittent 5-6 wave/sec activities in all leads. Hyperventilation resulted in an unusual augmentation of these conditions. During acupuncture, transient high voltage slow waves, sharp waves, spike-like waves or spike and slow wave complexes were elicited.

(1)-(2) Electroencephalogram taken at rest showed short coursed 7-9 wave/sec rhythm, regulation not good, intermittent 5-6 wave/sec activities elicited in various leads.

(3) Medium voltage spikes or spike-like waves appeared when acupuncture was applied over Tsu-san-li.

(4) Medium voltage slow activities appeared when acupuncture was applied over Tso-shen-men.

(5) Spike-like waves appeared when acupuncture was applied over Yu-shen-men.



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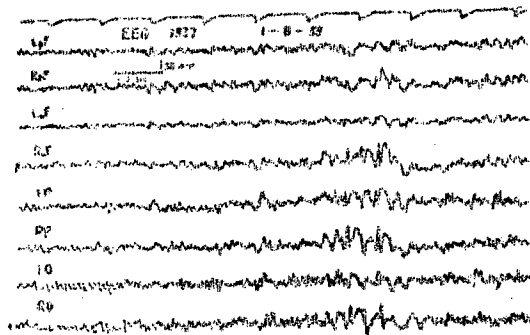
Figure 2

Case No 21, age 21, housewife, had frequent attacks of epileptic grand mals for 7 years. Electroencephalogram showed medium voltage 10-12 wave/sec short coursed rhythm, regulation not good, intervened by high voltage 3 wave/sec activities, spike and slow wave complexes, spikes or dicrotic type waves. Acupuncture resulted in a marked reduction of these with better frequency and voltage regulation than before.

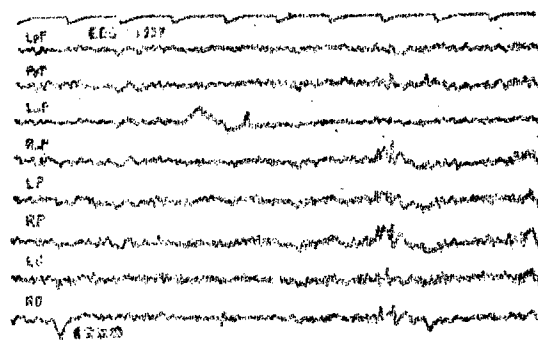
(1) Electroencephalogram at rest showed medium voltage 10-12 wave/sec short coursed rhythm, regulation not good, frequent appearances of intermittent spike and slow wave complexes.

(2) Spike and slow wave activities were reduced by acupuncture over Pai-hui.

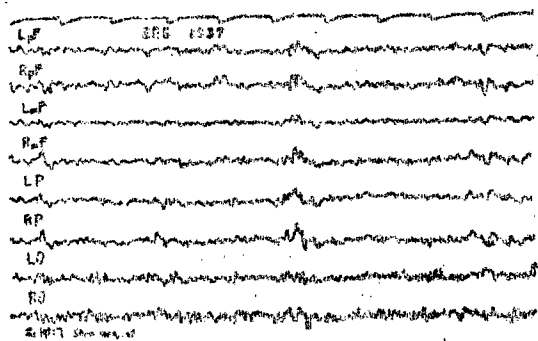
(3) -(6) Spike and slow wave complex activities were reduced even more by acupuncture over Shen-men, Jen-chung and Tsu-san-li.



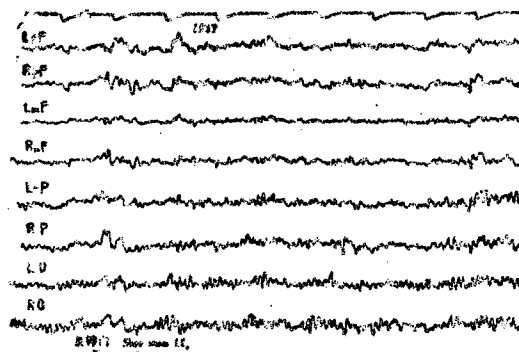
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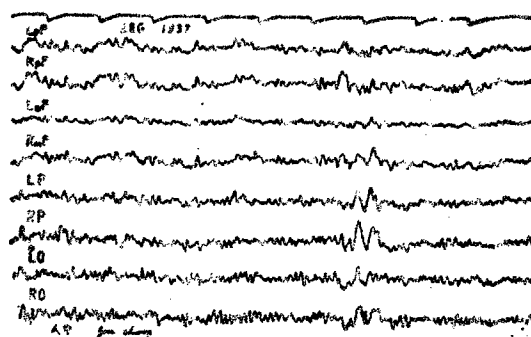
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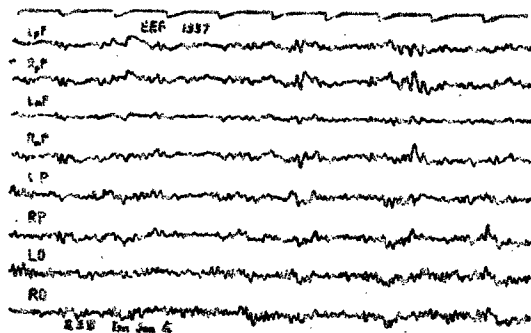
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(4)



(5)



(6)

Figure 3

Case No 25, age 6, male child, had numerous attacks of epileptic petit mals every day since infancy with occasional grand mals. Family history irrelevant. Electroencephalogram showed frequent bursts of long coursed high voltage 2-3 wave/sec bilateral synchronized spike and slow wave complexes with occasional 2 or 3 spikes in the complexes. After acupuncture, spike and slow wave complexes were distinctly reduced and atypical. After withdrawal of needles, petit mal activities increased again.

(1) Electroencephalogram at rest showed long coursed high voltage bilateral synchronized 2-3 times/sec spike and slow wave complexes.

(2)-(4) Electroencephalogram at rest showed discharges of petit mal (reduced amplification).

(5)-(6) Spike and slow wave complex activities reduced by acupuncture over Yu-shen-men and Pai-hui respectively (reduced amplification).

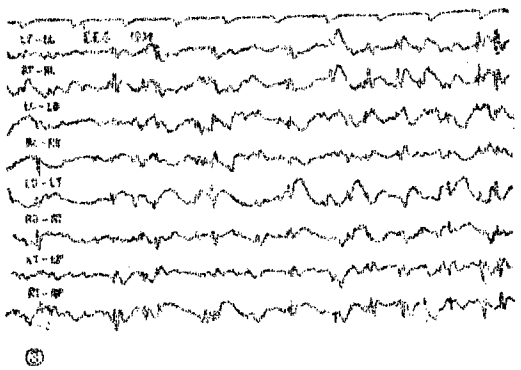
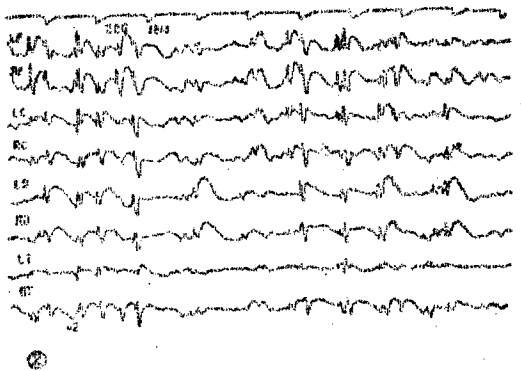
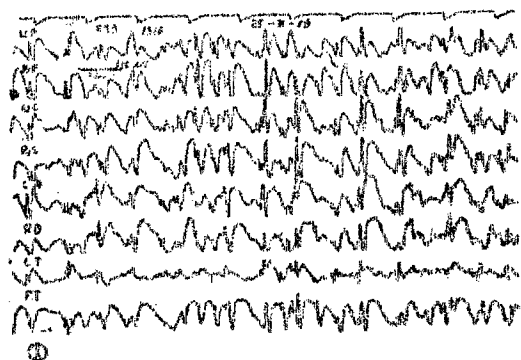
(7) Spike and slow wave complex activities distinctly reduced by acupuncture over Tso-shen-men (reduced amplification).

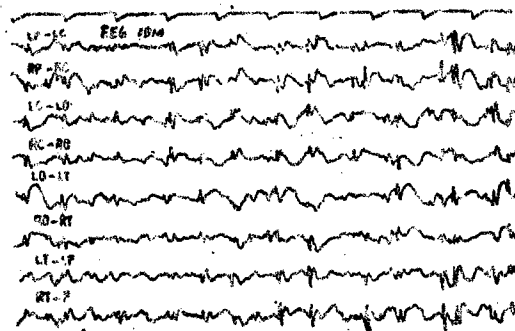
(8)-(11) Spike and slow wave complex activities dis-

appeared completely after 400 seconds of acupuncture over Jen-chung (reduced amplification).

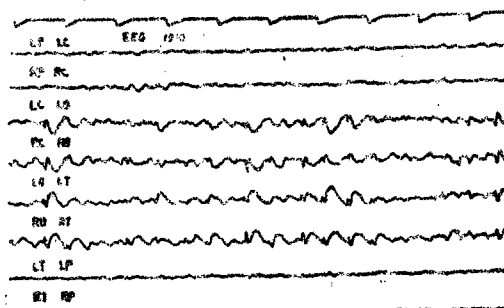
(12)-(14) Spike and slow wave complex activities almost completely disappeared after acupuncture over Shen-men and Pai-hui (reduced amplification).

(15) Reappearance of spike and slow wave activities 70 seconds after the withdrawal of needles (reduced amplification).



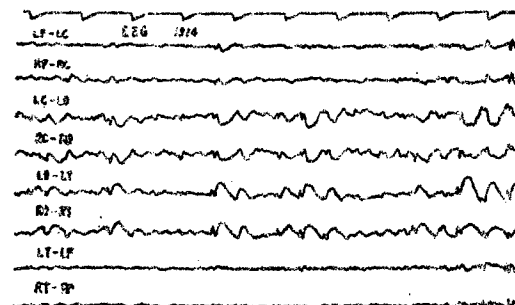


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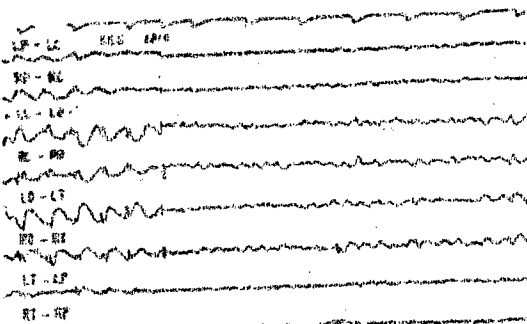
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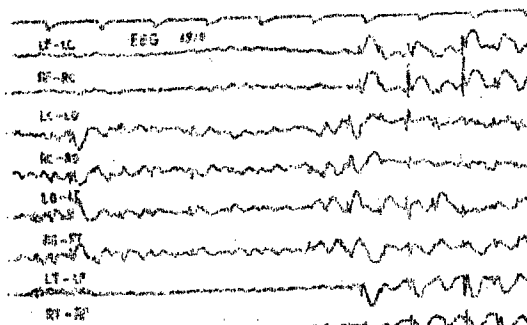
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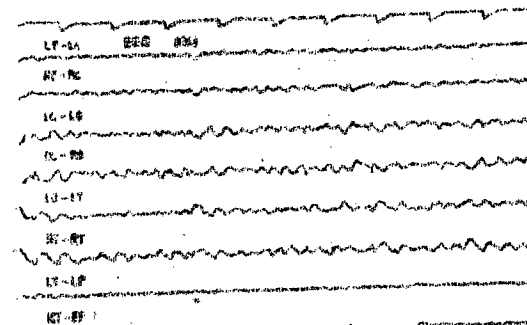
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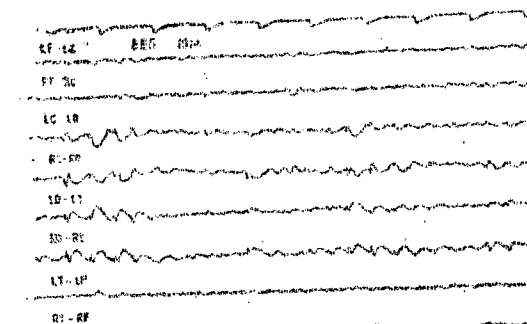
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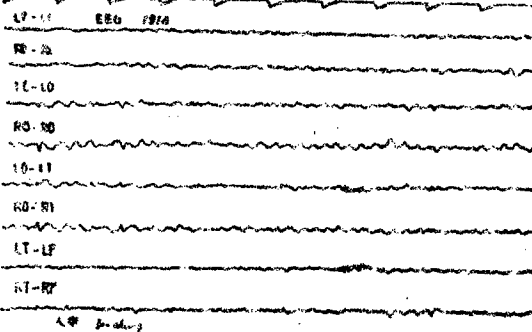
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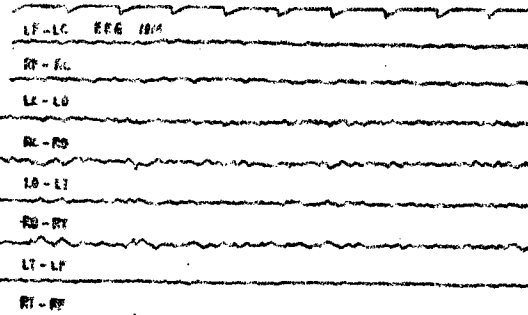


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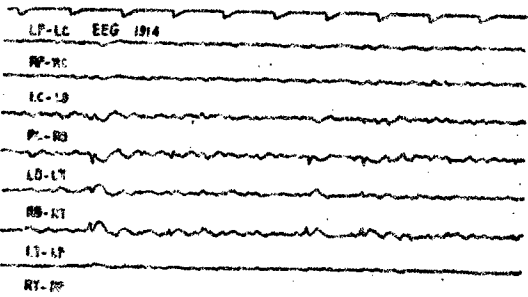


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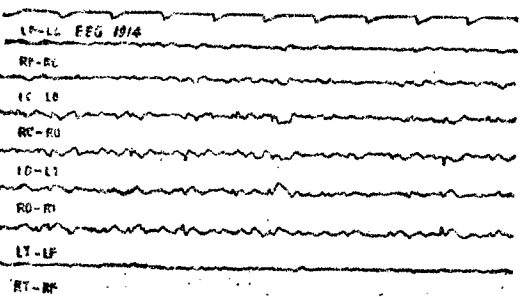
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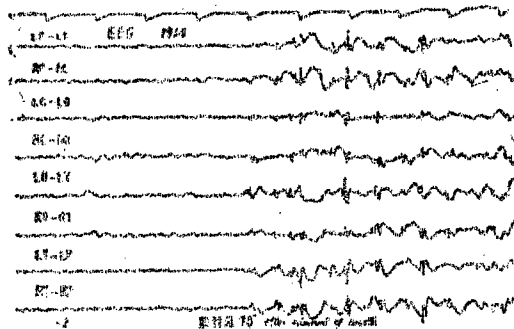
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In 3 epileptic grand and petit mals or petit mal patients (Nos 23, 24 and 25) in the third group with long coursed spike and slow wave complexes, distant improvements were elicited in the encephalograms after acupuncture. Lennox, Gibbs and Gibbs earlier reported that mental activity and carbon dioxide could prevent or alter the electric activity of the petit mal nature. Jung reported that sensory stimulations could inhibit electrical discharges in epileptic petit mal. Schwab said that light and sound stimulations could terminate a petit mal of medium degree severity. He therefore suggested we estimate the severity of petit mal with these kinds of stimulations. Li, Jasper and Henderson further pointed out that the usual encephalogram of diencephalon disease could be altered by various kinds of arousal stimulations. However, those of the diseases of the cerebral cortex would not respond to the arousal stimuli. All of these indicated that the abnormal brain waves of petit mal epilepsy were very sensitive to arousal stimulations. According to the results obtained in this report, acupuncture is without doubt one of the arousal stimuli that has an inhibitory effect on electric discharges of petit mal. Whe-

ther acupuncture or moxibustion can be a major therapeutic measure for epilepsy, especially epileptic petit mal, remains to be further investigated.

Conclusion

We applied acupunctures on 23 epileptic and 2 non-epileptic patients over the sites Pai-hui, Jen-chung, and Shen-man, etc. employing the P'ing-pu P'ing-hsieh manipulative technique and at the same time observed the changes in the patients' encephalograms. The 11 cases in the first group were older patients with longer durations of illness. The brain waves showed no reactions after acupuncture, or showed only attention phenomena. There was no alteration of the pre-existing wave irregularity. Most of the 12 patients in the second and third groups were younger in age with shorter durations of illness. In 5 cases in the second group, acupuncture induced transient high voltage slow waves, spikes or spike and slow wave complexes (synchronization phenomenon). In 7 cases in the third group, there were reductions in the pre-existing high voltage slow waves with better regulations in frequency and voltage after acupunctures were applied. Or, distinct reduc-

tions (desynchronization) in the pre-existing intermittent long-coursed spike and wave complexes. It could be that in the first group of patients, a stereotyped pattern was formed by pathological dynamics so that the cerebral cortex would not respond to acupuncture whereas plasticity of the cortex in patients of the second and third groups still existed. The appearance of either synchronization or desynchronization phenomena in a case seemed to be determined by the excitatory state of the cerebral cortex. The author believed that acupuncture is a kind of arousal stimulus. It is useful in the diagnosis and prognosis of cerebral cortex activities in epileptic patients and will have a certain effect in the treatment of early stages of epilepsy in younger patients with shorter durations of illness, especially the petit mal cases.

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